

U.S.S.N. 10,804,713

Claim Amendments

Please amend claims 1, 6, 9, 10, 14, and 16-26 as follows:

(claim 22 is changed from an independent claim to a dependent claim.)

Please cancel claims 7, 8, 27 as follows:

Please add new independent claim 28 as follows:

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Claims as Amended

1. (currently amended) A semiconductor device fuse structure to prevent dielectric layer cracking at corner portions of associated metallization structures comprising:

a substrate;

a top inter-metal dielectric layer on said substrate;

at least two top metal lines in said top inter-metal dielectric layer, said at least two top metal lines comprising a topmost metal layer in electrical communication with at least one lower metal layer comprising a first metal layer;

a fuse on said top inter-metal dielectric layer, said fuse in providing electrical communication between with at least one of said at least two top metal lines by spanning a distance between said at least two top metal lines; and

a protective layer on said fuse; and

a window formed through a thickness portion of the protective layer, said window positioned over a top portion of said fuse.

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2. (original) A semiconductor device according to claim 1, wherein said protective layer on said fuse comprises a dielectric layer.
3. (original) A semiconductor device according to claim 2, wherein said dielectric layer comprises silicon dioxide.
4. (original) A semiconductor device according to claim 1, wherein said fuse comprises an aluminum fuse.
5. (original) A semiconductor device according to claim 1, wherein said at least two top metal lines comprises copper.
6. (currently amended) A semiconductor device fuse structure to prevent low dielectric material layer cracking at corner portions of associated metallization structures comprising:

 an two separated and respectively interconnected metallization structures, each of said metallization structures comprising copper and extending through a plurality of low dielectric material inter-metal dielectric layers surrounding the structure; and

 wherein a fuse comprising aluminum connected to extends between each of the

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~~metallization structures in an uppermost inter-metal dielectric layer; and,~~

~~a window is disposed over a top portion of said fuse, said window extending through a thickness portion of a silicon dioxide layer on said fuse.~~

7. cancelled

8. cancelled

9. (currently amended) The semiconductor device as set forth in claim 6 wherein ~~each of the metallization structures include[[s]] a first metal layer and a topmost metal layer, each of said topmost metal layers connected to said fuse and further comprising an inter-metal-dielectric layer comprising a low dielectric constant material interposed between the first metal layer and a second metal layer of the structure.~~

10. (currently amended) The semiconductor device as set forth in claim 9 further comprising an etch stop layer on each ~~an upper main face and a lower main face~~ face of the ~~uppermost inter-metal dielectric layer.~~

11. (original) The semiconductor device as set forth in claim 9 further comprising a plug extending between the first metal layer and the topmost metal layer of the structure.

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12. (original) The semiconductor device as set forth in claim 6 wherein the aluminum fuse has a thickness ranging from 1000-7000 angstroms.

13. (original) The semiconductor device as set forth in claim 9 wherein the topmost metal layer of the structure has a thickness of at least 8000 angstroms.

14. (currently amended) A semiconductor device including a fuse comprising a first layer comprising a copper island ~~disposed in a low dielectric material inter-metal dielectric layer~~ and a second layer overlying the first layer, and wherein the second layer comprises aluminum; ~~and,~~

~~a fuse window disposed over said second layer, said fuse window extending through a thickness portion of at least one dielectric layer overlying said fuse.~~

15. cancelled

16. (currently amended) The semiconductor device as set forth in claim ~~45~~ 14 wherein the ~~at least one dielectric layer~~ comprises ~~a passivation layer on the second layer, said passivation layer comprising~~ silicon dioxide.

17. (currently amended) The semiconductor device as set forth in claim 14 further

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include[[es]]ing a first metal layer and a topmost metal layer ~~comprising the copper island and further comprising an~~ wherein the inter-metal dielectric layer ~~comprising a low dielectric material~~ is interposed between the first metal layer and the topmost metal layer.

18. (currently amended) The semiconductor device as set forth in claim 17 further comprising an etch stop layer on each ~~an upper main face and a lower main face~~ of the inter-metal dielectric layer.

19. (currently amended) The semiconductor device as set forth in claim 17 further comprising ~~wherein the at least one dielectric layer comprises a first fuse passivation layer overlying the topmost metal layer on said second layer and a dielectric layer on said passivation layer wherein said fuse passivation layer comprises silicon dioxide.~~

20. (currently amended) The semiconductor device as set forth in claim 17 further comprising a plug extending among each second ~~between the first metal layer and the topmost metal layer.~~

21. (currently amended) A semiconductor device as set forth in claim 19 further comprising a ~~wherein said fuse window formed extends through the passivation layer down dielectric layer to the fuse passivation layer overlying the fuse.~~

22. (currently amended) A method of blowing [[a]] ~~the~~ fuse in a semiconductor device including

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~~at least a first metallization layer comprising copper and a fuse connected to the first metallization layer, and the fuse structure of claim 1 wherein the fuse comprises aluminum, comprising: directing a laser beam onto the fuse using a wavelength ranging from 300-500 or 1000-1400 nm through the protective layer.~~

23. (currently amended) The method as set forth in claim 22 wherein the semiconductor device further includes ~~protective layer comprises~~ a fuse passivation layer overlying on an upper face of the fuse.

24. (currently amended) The method as set forth in claim ~~[[22]]~~ 23 wherein the fuse passivation layer comprises silicon dioxide.

25. (currently amended) The method as set forth in claim 22 wherein ~~an upper face of~~ the fuse comprises a first layer comprising aluminum.

26. (currently amended) The method as set forth in claim 22 wherein the ~~fuse comprises a first layer comprising a copper island~~ top two metal lines comprise copper and a second layer comprising aluminum.

27. cancelled

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28. (new) A method of blowing a fuse structure to prevent low dielectric material layer cracking at corner portions of associated metallization structures, said fuse structure comprising:

a fuse window formed through at least one dielectric layer overlying an upper face of an aluminum fuse to expose a passivation layer comprising silicon dioxide on said fuse, said fuse window selectively disposed over said upper face of said aluminum fuse;

said aluminum fuse spanning a distance between two copper metallization structures, each of said copper metallization structures comprising interconnected damascene structures extending through a plurality of low dielectric material layers;

wherein said method comprises:

directing a laser beam onto said fuse through said silicon dioxide passivation layer using a wavelength ranging from 300-500 or 1000-1400 nm.